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PROXIMATE COMPOSITION OF CASSAVA PEELS ENSILED WITH CASSAVA, *GLIRICIDIA* AND *LEUCAENA* LEAF MEALS PREPARED UNDER A HUMID ENVIRONMENT

A.I. Ukanwoko[1] and C. Ukandu[2].
[1]Department of Animal Science and Fisheries, University of Port Harcourt,
P. M. B. 5323, Choba, Rivers State, Nigeria, [2]College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike.

ABSTRACT
An experiment to determine the proximate composition of ensiled cassava peels, cassava peels + *Gliricidia sepium*, Cassava peels + cassava leaves and cassava peels + *Leucaena leucocephala* was conducted. Proximate composition of the fresh samples was equally determined. Results obtained were subjected to analysis of variance (ANOVA) as applicable to a completely Randomized Design (CRD). Significant means were separated by Duncan's Multiple Range Test. Silage samples did not differ significantly (P> 0.05) in their physical properties, however, they differed significantly (P<0.05) in their chemical properties. Silage prepared from a mixture of cassava peels + *Leucaena leucocephala* had the highest crude protein content (24.75%) while that prepared from cassava peels alone had the lowest crude protein content (4.50%). The crude fiber (CF) content of the silages ranged from 13.83% in cassava peel ensiled with *Leucaena leucocephala* to 17.21% in cassava peels ensiled alone. The calcium content of the silages were significantly different (P<0.05) with the highest (3.01%) in silage prepared from cassava peel + *L. leucocephala.* The silages were excellently prepared judging from the pH range of 4.17 – 4.32. The silage prepared from mixtures of the cassava peels and the leaf meals proved superior.

KEYWORDS: Cassava peels, *Leucaena leucocephala*, pH, silage.

INTRODUCTION

Protein inadequacy in the diets of most people in a number of developing countries as Nigeria has been a major concern to the animal scientist. Livestock generally contributes immensely to meat, milk, hides and skin as well as manure production in Nigeria. Despite these contributions, their productivity has remained generally low due to inadequate and irregular nutrition (Mohammed, 1989). Efforts to lower the cost of production have elicited current interest in the search and use of non conventional feedstuffs as protein and energy sources for livestock production. There is the need to increase protein intake to a level which compares with that of developed nations. The scarcity of dry season fodder for ruminants pose a serious problem leading to small scale livestock production in Nigeria.

A good number of forage species have been noted as being useful livestock feeds (Adegbola and Okonkwo, 2002). Legumes such as *Gliricidia sepium*, *Leucaena leucocephala*, and *Cajanus cajan* have been used recently as protein sources for different species of livestock with good results. *Gliricidia sepium* is generally used as a high protein (18 - 30% CP) and mineral supplement to low quality feeds such as straw, grass and other crop residues (Yousuf *et al*, 2007). The crude protein content of 24.7% in cassava leaves (Ravindran, 1991) compares favorably with the value of 22.8% CP (Limcango – Lopez 1997) in *Leuceana* leaves. Cassava leaves have 16.7 – 39.9% protein content (Yousuf *et al* 2007) with almost 85% of the crude protein fraction as true protein (Ravindran, 1991).

Silage making offers one option, to secure feeds during seasons of high production for conservation and storage for later use in period of scarcity. Silage can be used at any time especially during periods of drought (Koon, 1993).

This study is therefore aimed at evaluating the chemical composition of ensiled cassava peels, cassava peels + *Gliricidia sepium*, Cassava peels + *Leucaena leucocephala* and cassava peels + cassava leaves.

MATERIALS AND METHODS

Cassava peels/leaf meals

Cassava peels and other leaves viz cassava leaves, *Gliricidia sepium* and *leucaena leucocephala* were all collected from the forest in Michael Okpara University of Agriculture, Umudike during the rainy season (July – September) and these materials were chopped into different pieces of about 3 - 4cm length. The chopped peels were partially wilted for 5 hours to reduce the moisture content. The chopped peels together with mixtures of *Gliricidia sepium,* cassava leaves and *Leucaena leucocephala* were all compressed into a plastic container to ensure maximum elimination of air, and they were covered with black polythene sheets. There were four treatments:

a. 100% cassava peels ensiled alone.
b. 50: 50 cassava peels + *Leucaena leucocephala* leaves
c. 50:50 Cassava peels + Cassava leaves
d. 50:50 Cassava peels + *Gliricidia sepium* leaves.

The treatments were replicated three (3) times. Wet weight of materials was taken before ensiling. At 30 days, the containers were opened and physical properties such as moldiness, odor, color changes and moistness were determined by rating the quantities using the physical characteristics rating scale as shown in Table 1.

Chemical Analysis

Samples of the different silages were taken and oven – dried at 60^{o}C for dry matter (DM) estimation. The samples were ground in the laboratory with hammer mill of 1mm sieve and subjected to chemical analysis for the determination of crude protein (CP), crude fiber (CF), Ether extract (EE) and ash following AOAC (2004) techniques.

Statistical Analysis

The data obtained from the chemical analysis were subjected to analysis of variance (ANOVA) according to Steele and Torrie (1980). Significant differences between means were determined using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The physical properties of the silages are presented in Table 2. These characteristics (Color, moisture, odor and moldiness) help us to determine well preserved silages. Generally, in terms of acceptability of silage to animals, the most important physical characteristics are odor. The silage produced from cassava peels alone was light greenish brown as against silages produced from mixtures of cassava peels +*Leucaena*, cassava peels + cassava leaves and cassava peels + *Gliricidia* leaves. The silages produced from the mixtures of cassava peels + L*eucaena*, cassava peels + cassava leaves and cassava peels + *Gliricidia* were less moldy than the silage produced from cassava peels alone. When silage materials were allowed to wilt under shade, cassava peels were still turgid. These physical features like odor and color were similar to the one obtained from Man and Wiltorsson (2002) and Oduguwa *et al* (2007).

The proximate composition of fresh ensiling materials is presented in Table 3. The CP contents of the three leaf meals used in this study were within the range of 25.81- 30.09%. This range compares favorably with those reported by Ayodeji, 2005 and Yousuf *et al* 2007. The CF content of the cassava peel was higher than those of the leaf meals. Cassava peel had lower concentrations of CF, ether extract, calcium and phosphorus. The proximate composition of the silages is presented in Table 4. The crude protein contents of the silages were significantly different ($P<0.05$). The silages prepared from a mixture of cassava peel and the meals proved superior in terms of CP than that prepared from cassava peels alone. The 24.75% CP content of the silage from cassava peel + *L. leucocephala* reported in this study was lower than 30.20% CP content reported by Yousuf *et al* (2007) but higher than 22.80% CP content reported by Limcango – Lopez (1997) for fresh *L. leucocephala.* Adegbola and Okonkwo (2002) reported 24.70% CP content in fresh cassava leaves as against a CP content of 20.45% reported in this study for cassava peel + cassava leaves silage. This was higher than a CP content of 18.15% reported by Dahlanuddin (2001). There were significant differences ($P<0.05$) in the CF of the silages. The silage prepared from cassava peel alone had the highest CF (17.21%) compared to the silages prepared from cassava peels and the leaf meals. Dahlanuddin (2001) reported CF contents of 17.78, 20.80 and 20.00% for fresh *L. leucocephala, G. sepium* and cassava leaves, respectively as against the CF contents of 14.25, 14.22 and 13.83% reported for silages prepared from same leaf meals in this study. The calcium contents of the silages

were significant (P<0.05). Silage prepared from cassava peel + *L. leucocephala* had the highest calcium content. The pH values of the silages fell within the range of 4.17 – 4.32. This showed that the silages were well prepared as they fell into the range of excellent silages (Obua, 2005). In general, there tended to be a decline in nutrients in nutrient contents from the ensiling materials to the silages. Silages have been reported to conserve about 75% of the nutrients in the fresh samples (Obua, 2005), this is true of this study. Additives have been recommended to improve fermentation and nutritive value of silages (Yakota *et al*. 1992) and they can be added during wilting (Aganga *et al*. 2005).

CONCLUSION AND RECOMMENDATION

Silages produced from the mixtures of cassava peels and the leaf meals proved superior with that from cassava peel + *L. leucocephala* the best. The silages prepared from cassava peel and the leaf meals can be fed to ruminants since they have more than 9 – 14% CP recommended for optimum performance of ruminants. Additives can also be added during the preparation of silages to improve fermentation and the nutritive values of silages.

REFERENCES

Adegbola, T. A. and Okonkwo, J. C. (2002). Nutrient intake, digestibility and growth rate of rabbits fed varying levels of cassava leaf meal. *Nig. J. of Anim. Prod*. 29(1), 21-26

Aganga, U. J., Omphile, T. T. and Baitsholi, J. C. (2005). Chemical composition of Napier grasses (*Pennisetum purpureum)* at different stages of growth and Napier grass silage with additives. *Thai. J. Agric*. 26. 207 – 213.

A.O.A.C (2004). Association of Official Analytical Chemists. Official method of analysis Association. 16th Edition.

Ayodeji, O. F. (2005). Nutrient composition and processing effect on cassava leaf (*Manihot esculenta*, Crantz) antinutrients. *Pakis. J. of Nut*. 4(1), 37 – 42.

Dahlanuddin. (2001). Forages commonly available to goats under farm conditions on Lombok Island, Indonesia. Lives. *Res. for Rural Dev*. 13(1). http://www.cipav.org.co/lrrd13/1/dahl131.htm

Hassan, D. (2004). Physical properties of guinea grass (*Panicum maximum* jacg) and cassava leaves (*Manihot esculentus* crantz var texas)silage using low cost containers. *B.Sc Project report* University of Agriculture, Abeokuta, Ogun State, Nigeria.

Koon, L.L. (1993). Production of Sila wrap silage from fodder grass species for dry season feeding. In: *Strategies for suitable forage based livestock production in Southwest Asia*. Proceedings of the third meeting of the regional working group on grazing and feedresources of South West Asia 31 Jan.- 6 Feb. 1998. Khon Kaen Thailand. pp103 – 109.

Limcango Lopez, P.D. (1997). The use of shrubs and tree fodders by non-ruminants. In: *Cassava as animal feed*. (Editors: Nestle, B. and Graham, M.). PP. 61-75. IDRC 095e Guelph.

Man, N.V. and Wiltorsson, H. (2002). Cassava top ensiled with or without molasses as additives: effects on quality, feed intake and digestibility by heifers. Asian – *Aust. J.Anim. Sci*. Vol. 14(5): 624-630.

Mohammed, A.N. (1989). *Current approaches to animal production*. The case of the ruminants. A paper delivered at the animal conference of the Professors World Peace Academy of Nigeria, University of Ibadan. December, 1980.

Obua, B. E. (2005). *Forage conservation in Nigeria*. Concave Publications Owerri, Nigeria.

Oduguwa, B. O; Jolaosha, A. O. and Ayakoso, M. T. (2007). Effects of ensiling on the physical properties, chemical composition and mineral content of guinea grass and cassava top silage. University of Agriculture. Abeokuta, Nigeria. J. *of Nig. Soc. For Anim. Prod.* 34 (1): 100-106.

Ravindran, V. (1991). Preparation of cassava leaf production and their use as animal feed. In: *Roots tubers, Plantains and bananas in animal feeding* (Editors: Dmachin and solveing Nyvold). F.A.O. Anim Prod. And Hlth. Paper No. 95:111-122.

Steele, R.G.C. and Torrie S.H. (1980). *Principles and procedures of statistics*. McGraw Hill. New York.

Yokota, H. T. O. and Ohshima (1992). Nutritive value of Napier grass (*Pennisetum purpureum* sichum). Silage ensiled without molasses for goat. Asian. *Aust. J. Anim. Sci*. 5:33- -37.

Yousuf, M. B., Belewu, M. A., Daramolar, J. O. and Ogundun, N. I. (2007). Protein supplementary values of cassava-, *Leucaena*- and *Gliricidia* leaf meals in goats fed low quality *Panicum maximum hay*. Lives. *Res. for Rural Dev*. http://www.lrrd.org/lrrd19/2/yous19023.htm

Table 1. Physical Characteristics rating scale.

Scale	Moldiness	Odor	Color	Moisture
1	Without Mould	Pleasant	Light-greenish brown	No moisture
2	Slightly Moldy	Fairly pleasant	Greenish brown	Slightly moist
3	Averagely Moldy	Averagely Pleasant	Dark brownish green	Averagely moist
4	Highly Moldy	Slightly Pungent	Brown	Heavily moist
5	Black Spores	Pungent	Dark brown	Completely moist

Source: Adapted from Hassan (2004)

Table 2. Physical properties of different silages

	Types of silages			
Properties	A(CP)	B(CGS)	C(CCL)	D(CLL)
Color	1.7	2.3	2.3	2.0
Moisture	1.8	2.3	2.0	2.3
Odor	2.0	2.1	2.3	1.7
Moldiness	2.1	1.5	1.8	1.9

CP = Cassava peels ensiled alone. CCL = Cassava peels ensiled with cassava leaves.
CGS = Cassava peels ensiled with *Gliricidia sepium* Leaves. CLL= Cassava peels ensiled with *Leucaena leucocephala* leaves.

Table 3. Proximate composition of fresh ensiling materials

	Ensiling materials			
Ingredients (%)	Cassava peels	*G. sepium*	Cassava leaves	*L. leucocephala*
Dry matter	86.22	79.22	88.29	85.32
Crude protein	6.50	27.95	25.81	30.09
Crude fiber	21.61	17.82	16.28	18.67
Ether extract	1.13	5.63	5.74	5.43
Ash	3.81	4.16	3.64	3.33
Calcium	0.64	2.02	1.92	3.11
Phosphorus	0.12	0.29	0.33	0.20

Table 4. Proximate composition of the silages.

	Silages				
Ingredients (%)	A (CP)	B (CGS)	C (CCL)	D (CLL)	SEM
Dry matter	65.11[b]	63.45[c]	69.27[a]	68.77[a]	0.69
Crude protein	4.50[c]	21.75[b]	20.45[b]	24.75[a]	1.52
Crude fiber	17.21[b]	14.22[a]	13.83[a]	14.25[a]	0.58
Ether extract	0.85	2.02	2.19	1.93	2.25
Ash	2.86	3.08	2.93	2.67	4.2
Calcium	0.85[c]	2.01[b]	1.91[b]	3.01[a]	0.31
Phosphorus	0.14	0.17	0.21	0.19	0.72
pH	4.32	4.22	4.31	4.17	0.23

[abcd]Means on the same row with different superscripts differ significantly (P<0.05)
CP= Cassava peels ensiled alone, CGS = Cassava peels ensiled with *G. sepium*,
CCL = Cassava peel ensiled with cassava leaves, CLL = Cassava peel ensiled with *L. leucocephala*

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Corresponding author
C. Ukandu.
College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike.
Email: ndutonia@yahoo.com

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